

Claims

- [c1] 1. A method of protecting a liquid fuel nozzle used in a dual-fuel gas turbine having a compressor, a combustor, and a turbine, the method comprising:
flowing one of liquid fuel and purge air via a fuel passageway into the combustor;
flowing atomizing air into the combustor via a first passageway; and
interconnecting said first passageway with a second passageway, said first passageway disposed adjacent to said second passageway via a conduit to enable fluid flow therebetween to protect the nozzle from ingestion of hot combustor gases.
- [c2] 2.The method according to claim 1 further comprising:
eliminating a dedicated purge air system for said second passageway.
- [c3] 3.The method according to claim 2 wherein said eliminating said dedicated purge air system for said second passageway reduces a risk of combustor flame-out due to excessive rapid introduction of water into the combustor.

[c4] 4.The method according to claim 2 wherein when an operation of the turbine switches from liquid fuel to gaseous fuel, any water downstream of a first swirler disposed in said second passageway is atomized by the atomizing air prior to entering the combustor.

[c5] 5.A method for operating a dual fuel gas turbine having a combustor, a compressor and a turbine, the method comprising:
supplying liquid fuel to the combustor via a nozzle having a plurality of passageways, one of said passageways being a water injection passageway;
interconnecting said water injection passageway to one of said plurality of passageways via a conduit to enable fluid flow therebetween, said one of the plurality of passageways flowing high pressure air; and protecting the nozzle from ingestion of backflow combustion gases by diverting high pressure air from the one of said plurality of passageways into said water injection passageway via said conduit.

[c6] 6.The method according to claim 5 further comprising:
eliminating a dedicated purge air system for said water injection passageway.

[c7] 7.The method according to claim 6 wherein said eliminating said dedicated purge air system for said water in-

jection passageway reduces a risk of combustor flame-out due to excessive rapid introduction of water into the combustor.

- [c8] 8.The method according to claim 6 wherein when an operation of the turbine switches from liquid fuel to gaseous fuel, any water downstream of a first swirler disposed in the water injection passageway is atomized by the atomizing air prior to entering the combustor.
- [c9] 9.In a dual-fuel gas turbine having a compressor, a combustor, and a turbine, a method of protecting a liquid fuel nozzle from ingestion of backflow combustion gases, the method comprising:
flowing water into the combustor via a water injection passageway; flowing high pressure air into the combustor via a first passageway; and interconnecting said first passageway and the second passageway via a conduit to direct flow of high pressure air from said first passageway to said second passageway into the combustor.
- [c10] 10.In a gas turbine having a compressor, a combustor and a turbine, a liquid fuel unit for flowing liquid fuel into the combustor via a nozzle assembly, the nozzle assembly comprising:
passageways for flowing a liquid fuel, water injection and high pressure air, respectively, into the combustor; a

conduit interconnecting said water injection passageway and said high pressure air passageway enabling diversion of at least a portion of the high pressure air flow from said high pressure air passageway into said water injection passageway via said conduit to protect the nozzle from ingestion of hot combustor gases;
a first swirler arranged in the water injection passageway; and
a first end of said conduit being coupled to said water injection passageway downstream of said first swirler and an opposite second end of said conduit being in communication with the high pressure air passageway, the first end of said conduit being in communication with said water injection passageway downstream of said first swirler.

[c11] 11.A nozzle assembly according to claim 10, including a second swirler disposed in the high pressure air passageway, the second end of said conduit being in communication with said high pressure air passageway upstream of said second swirler.

[c12] 12.A liquid fuel nozzle assembly for supplying liquid fuel to a combustor of a gas turbine, the nozzle assembly comprising:
a water injection for flowing water into the combustor;
an air passageway disposed adjacent to the water injection

tion passageway for flowing atomizing air into the combustor, the water injection passageway and the atomizing air passageway being interconnected by a conduit to enable flow therebetween to protect the nozzle from ingestion of hot combustor gases;

a first swirler unit disposed in said water injection passageway;

a second swirler unit disposed in said air atomizing passageway, said first and second swirler units disposed proximate an exit of said respective water injection and atomizing air passageways, said first and second swirler units acting as primary pressure drops in the respective passageways; a first end of said conduit being in communication with said water injection passageway at a location downstream of said first swirler unit and an opposite second end of said conduit being in communication with said atomizing air passageway at a location upstream of said second swirler unit.

[c13] 13.A nozzle assembly according to claim 12 wherein the atomizing air passageway is maintained at a higher pressure than the water injection passageway.

[c14] 14.The nozzle assembly according to claim 12 wherein said conduit allows for eliminating a dedicated purge air system for the second passageway.

- [c15] 15.The nozzle assembly according to claim 14 wherein said eliminating said dedicated purge air system for the second passageway reduces a risk of combustor flame-out due to excessive rapid water introduction into the combustor.
- [c16] 16.The nozzle assembly according to claim 14 wherein when an operation of the turbine switches from liquid fuel to gaseous fuel, any water downstream of the first swirler in the water injection passageway is atomized by the atomizing air prior to entering the combustor.
- [c17] 17.In a dual-fuel gas turbine having a compressor, a combustor and a turbine, a method of passively protecting a liquid fuel nozzle, the method comprising:
flowing a liquid fuel, water injection, and atomizing air into the combustor via respective nozzle passageways;
coupling said water injection and said atomizing air passageways to one another via a conduit;
diverting at least a portion of high pressure air from said atomizing air passageway into said water injection passageway to protect the nozzle from ingestion of hot combustor gases;
disposing first and second swirler units for said water injection and atomizing air passageways, respectively, adjacent exit ends thereof;
coupling a first end of said conduit to said water injec-

tion passageway at a location downstream of said first swirler unit in the water injection passageway; and coupling an opposite second end of said conduit to said atomizing air passageway at a location upstream of a second swirler unit in said atomizing air passageway.